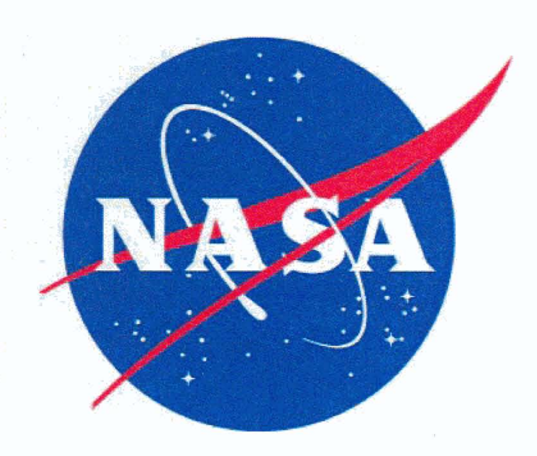
JSC-20584

Spacecraft Maximum Allowable Concentrations for Airborne Contaminants

Toxicology Group
Environmental Factors Office
Habitability and Environmental Factors Division
Space Life Sciences Directorate

November 2008



National Aeronautics and Space Administration

Lyndon B. Johnson Space Center
Houston, Texas

JSC 20584

SPACECRAFT MAXIMUM ALLOWABLE CONCENTRATIONS

FOR AIRBORNE CONTAMINANTS

2008

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Errata

Correct CAS numbers are below:

Freon 11	75-69-4
Glutaraldehyde	111-30-8
Hydrogen chloride	7647-01-0
Limonene	5989-27-5

SPACECRAFT MAXIMUM ALLOWABLE CONCENTRATIONS FOR AIRBORNE CONTAMINANTS
2008

The enclosed table lists official spacecraft maximum allowable concentrations (SMACs), which are guideline values set by the NASA/JSC Toxicology Group in cooperation with the National Research Council Committee on Toxicology (NRCCOT). These values should not be used for situations other than human space flight without careful consideration of the criteria used to set each value. The SMACs take into account a number of unique factors such as the effect of space-flight stress on human physiology, the uniform good health of the astronauts, and the absence of pregnant or very young individuals. Documentation of the values is given in a 5 volume series of books entitled "Spacecraft Maximum Allowable Concentrations for Selected Airborne Contaminants" published by the National Academy Press, Washington, D.C. These books can be viewed electronically at http://books.nap.edu/openbook.php?record_id=9786&page=3.

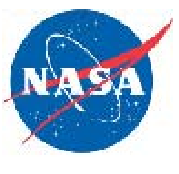
Short-term (1 and 24 hour) SMACs are set to manage accidental releases aboard a spacecraft and permit risk of minor, reversible effects such as mild mucosal irritation. In contrast, the long-term SMACs are set to fully protect healthy crewmembers from adverse effects resulting from continuous exposure to specific air pollutants for up to 1000 days. Crewmembers with allergies or unusual sensitivity to trace pollutants may not be afforded complete protection, even when long-term SMACs are not exceeded.

Crewmember exposures involve a mixture of contaminants, each at a specific concentration (C_n). These contaminants could interact to elicit symptoms of toxicity even though individual contaminants do not exceed their respective SMACs. The air quality is considered acceptable when the toxicity index (T_{grp}) for each toxicological group of compounds is less than 1, where T_{grp} is calculated as follows:

$$T_{grp} = C_1/SMAC_1 + C_2/SMAC_2 + \ldots + C_n/SMAC_n$$

Toxicological groups are defined according to the target organ and the nature of the toxic response from exposure to the compounds in the group. As shown in the table of SMACs, the target organ and toxic effect can change depending on the duration of exposure.

Early editions of this document contained many SMACs "developed" before 1990 when the cooperative effort between NASA and the NRCCOT began. These values had been considered official; however, an effort to determine how these values were set revealed that there was not an adequate document trail to continue to consider these old values as official SMACs. These old values will continue to be posted in the "MAPTIS" database, which is used to evaluate materials and hardware offgassing data, but they have been deleted from the present edition of this document. Many unofficial SMACs for groups of compounds with structural similarities (e.g. aliphatic ethers, aliphatic ketones) have been set with limited documentation and no review by the NRCCOT. These unofficial group SMACs can be obtained from the JSC Toxicology Group.





SMACs (Spacecraft Maximum Allowable Concentrations)

Potential Exposure Duration

Chemical

Acetaldehyde

Synonyms:

NRC Vol. #: 1 CAS #: 75-07-0

Year SMAC was Set/ Reviewed: 1992

Remarks: Carcinogen

	1 hr		24 hr		7 d		30 d		180 d		1000 d	
	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)
	10	(18)	6	(10)	2	(4)	2	(4)	2	(4)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation		

Acetone

Synonyms: 2-Propanone

NRC Vol. #: 4 CAS #: 67-64-1

Year SMAC was Set/ Reviewed: 1994

Remarks:

	1 hr		24 hr		7 d		30 d		180 d		1000 d	
	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)
	500	(1200)	200	(500)	22	(52)	22	(52)	22	(52)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	CNS	Fatigue	CNS	Fatigue	CNS	Fatigue Headache	CNS	Fatigue Headache	CNS	Fatigue Headache		

Acrolein

Synonyms: Propenal

NRC Vol. #: 5 CAS #: 107-02-08

Year SMAC was Set/ Reviewed: 2008

Remarks: Ceiling values

	1 hr		24 hr		7 d		30 d		180 d		1000 d	
	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)
	0.075	(0.2)	0.035	(0.08)	0.015	(0.03)	0.015	(0.03)	0.008	(0.02)	0.008	(0.02)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation

C2-C9 Aliphatic Alkanes

Synonyms:

NRC Vol. #: 5 CAS #: various

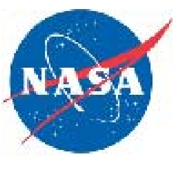
Year SMAC was Set/ Reviewed: 2005

Remarks:

	1 hr		24 hr		7 d		30 d		180 d		1000 d	
	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)	ppm	(mg/m^3)
	150	(varies)	80	(varies)	60	(varies)	20	(varies)	3	(varies)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Ototoxicity		
	Eye	Irritation	Eye	Irritation	CNS	Ototoxicity	CNS	Ototoxicity				
	Nose	Irritation	Nose	Irritation								

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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SMACs (Spacecraft Maximum Allowable Concentrations)

Potential Exposure Duration

C3-C8 Aliphatic Saturated Aldehydes

Synonyms:

NRC Vol. #: 5 CAS #: various

Year SMAC was Set/ Reviewed: 2008

Remarks:

Chemical	1 hr	24 hr	7 d	30 d	180 d	1000 d
ppm	45	45	4.5	4.5	4.5	4.5
(mg/m^3)	(varies)	(varies)	(varies)	(varies)	(varies)	(varies)
Organ	Mucosa	Mucosa	Nasal Cavity	Liver Nasal Cavity	Liver Nasal Cavity	Nasal Cavity
Effect	Irritation	Irritation	Injury	Hepatotoxicity Injury	Hepatotoxicity Injury	Injury

Ammonia

Synonyms:

NRC Vol. #: 5 CAS #: 7664-41-7

Year SMAC was Set/ Reviewed: 2008

Remarks: Ceiling values

Chemical	1 hr	24 hr	7 d	30 d	180 d	1000 d
ppm	30	20	3	3	3	3
(mg/m^3)	(20)	(14)	(2)	(2)	(2)	(2)
Organ	Eye	Eye	Eye	Eye	Eye	Eye
Effect	Irritation	Irritation	Irritation	Irritation	Irritation	Irritation

Benzene

Synonyms:

NRC Vol. #: 5 CAS #: 71-43-2

Year SMAC was Set/ Reviewed: 2008

Remarks: Leukemogen

Chemical	1 hr	24 hr	7 d	30 d	180 d	1000 d
ppm	10	3	0.5	0.1	0.07	0.013
(mg/m^3)	(35)	(10)	(1.5)	(0.3)	(0.2)	(0.04)
Organ	Blood	Blood	Blood	Blood	Blood Blood	Blood
Effect	Immunotoxicit	Immunotoxicit	Immunotoxicit	Immunotoxicit	Immunotoxicit Leukemia	Hematological

Bromotrifluoromethane

Synonyms: Halon 1301

NRC Vol. #: 3 CAS #: 75-63-8

Year SMAC was Set/ Reviewed: 1993

Remarks:

Chemical	1 hr	24 hr	7 d	30 d	180 d	1000 d
ppm	3500	3500	1800	1800	1800	Not Set
(mg/m^3)	(21000)	(21000)	(11000)	(11000)	(11000)	(Not Set)
Organ	Heart	Heart	CNS	CNS	CNS	
Effect	Arrhythmia	Arrhythmia	Depression	Depression	Depression	

Abbreviations:
CNS: Central Nervous System
CV: Cardiovascular
DCD: Decreased Color Discrimination
RespSys: Respiratory System
GI: Gastrointestinal tract
U.Blad: Urinary bladder
NRC: National Research Council
PNS: Peripheral Nervous System





SMACs (Spacecraft Maximum Allowable Concentrations)

Potential Exposure Duration

1- Butanol

Synonyms: n-butanol

NRC Vol. #: 5 CAS #: 71-36-3

Year SMAC was Set/ Reviewed: 2007

Remarks:

	1 hr	24 hr	7 d	30 d	180 d	1000 d
ppm	50	25	25	25	12	12
(mg/m³)	(150)	(80)	(80)	(80)	(40)	(40)
Organ / *Effect*	Eye / Irritation CNS / Depression	Eye / Irritation	Eye / Irritation Systemic	Eye / Irritation Systemic	Eye / Irritation Systemic	Eye / Irritation Systemic

tert- Butanol

Synonyms: 2-Methyl-2-propanol

NRC Vol. #: 3 CAS #: 75-65-0

Year SMAC was Set/ Reviewed: 1995

Remarks:

	1 hr	24 hr	7 d	30 d	180 d	1000 d
ppm	50	50	50	50	40	Not Set
(mg/m³)	(150)	(150)	(150)	(150)	(120)	(Not Set)
Organ / *Effect*	CNS / Depression	CNS / Depression	CNS / Depression	Kidney / Nephrotoxicity CNS / Depression	Kidney / Nephrotoxicity CNS / Depression U. Blad / Injury	

Carbon dioxide

Synonyms: CO2

NRC Vol. #: 5 CAS #: 124-38-9

Year SMAC was Set/ Reviewed: 2006

Remarks:

	1 hr	24 hr	7 d	30 d	180 d	1000 d
ppm	20000	13000	7000	7000	7000	5000
(mg/m³)	(35000)	(23000)	(13000)	(13000)	(13000)	(9000)
Organ / *Effect*	CNS / Hyperventilation CNS / Headache CNS / Visual disturbance	CNS / Hyperventilation CNS / Headache CNS / Visual disturbance	CNS / Hyperventilation CNS / Headache	CNS / Hyperventilation CNS / Headache	CNS / Hyperventilation CNS / Headache	CNS / Headache

Carbon monoxide

Synonyms: CO

NRC Vol. #: 5 CAS #: 630-08-0

Year SMAC was Set/ Reviewed: 2008

Remarks: Carboxyhemoglobin target

	1 hr	24 hr	7 d	30 d	180 d	1000 d
ppm	425	100	55	15	15	15
(mg/m³)	(485)	(114)	(63)	(17)	(17)	(17)
Organ / *Effect*	CNS / Depression CV / Arrhythmia	CNS / Depression CV / Arrhythmia	CNS / Depression CV / Arrhythmia	CNS / Depression CV / Arrhythmia	CNS / Depression CV / Arrhythmia	CNS / Depression CV / Arrhythmia

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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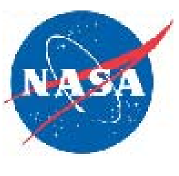
SMACs (Spacecraft Maximum Allowable Concentrations)

POTENTIAL EXPOSURE DURATION

Chemical	1 hr		24 hr		7 d		30 d		180 d		1000 d	
	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)
Chloroform	2	(10)	2	(10)	2	(10)	1	(5)	1	(5)	Not Set	(Not Set)
Synonyms: Trichloromethane	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression		
NRC Vol. #: 4 CAS #: 67-66-3	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Liver	Hepatotoxicity		
Year SMAC was Set/ Reviewed: 1999	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity		
Remarks:												
Decamethylcyclopentasiloxane	Not Set	(Not Set)	Not Set	(Not Set)	7	(100)	5	(75)	1	(15)	Not Set	(Not Set)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
					RspSys	Injury	RspSys	Injury	RspSys	Injury		
NRC Vol. #: 4 CAS #: 541-02-6					Gonad	Toxicity	Gonad	Toxicity	Gonad	Toxicity		
Year SMAC was Set/ Reviewed: 1998												
Remarks: Documented as a polydimethylcyclosiloxane												
Diacetone alcohol	50	(250)	50	(250)	20	(100)	6	(30)	4	(20)	Not Set	(Not Set)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Liver	Hepatomegaly		
	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression	CNS			
NRC Vol. #: 3 CAS #: 123-42-2										Depression		
Year SMAC was Set/ Reviewed: 1995												
Remarks:												
Dichloroacetylene	0.6	(2.4)	0.04	(0.16)	0.03	(0.12)	0.025	(0.10)	0.015	(0.06)	Not Set	(Not Set)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression		
NRC Vol. #: 3 CAS #: 7572-29-4	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity		
Year SMAC was Set/ Reviewed: 1992	Liver	Hepatotoxicity	Liver	Hepatotoxicity								
Remarks:												

Abbreviations:
CNS: Central Nervous System
CV: Cardiovascular
DCD: Decreased Color Discrimination
RespSys: Respiratory System
GI: Gastrointestinal tract
U.Blad: Urinary bladder
NRC: National Research Council
PNS: Peripheral Nervous System

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SMACs (Spacecraft Maximum Allowable Concentrations)

Potential Exposure Duration

Chemical	1 hr ppm	1 hr (mg/m³)	24 hr ppm	24 hr (mg/m³)	7 d ppm	7 d (mg/m³)	30 d ppm	30 d (mg/m³)	180 d ppm	180 d (mg/m³)	1000 d ppm	1000 d (mg/m³)
1,2- Dichloroethane	0.4	(1.6)	0.4	(1.6)	0.4	(1.6)	0.4	(1.6)	0.4	(1.6)	0.4	(1.6)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
NRC Vol. #: 5 CAS #: 107-06-2	G.I.	GI Toxicity	G.I.	GI Toxicity	G.I.	GI Toxicity	G.I.	G.I. Toxicity	G.I.	G.I. Toxicity	G.I.	G.I. Toxicity
Year SMAC was Set/ Reviewed: 2007	.		.		.		.				Liver	Hepatotoxicity
Remarks: Impairs host defenses against bacteria.												
Ethanol	5000	(10000)	5000	(10000)	1000	(2000)	1000	(2000)	1000	(2000)	1000	(2000)
Synonyms: Ethyl alcohol	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Eye	Irritation	Eye	Irritation	Eye	Irritation	Eye	Irritation	Eye	Irritation	Eye	Irritation
NRC Vol. #: 5 CAS #: 64-17-5	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation
Year SMAC was Set/ Reviewed: 2007	Skin	Flushing	Skin	Flushing	Skin	Flushing	Skin	Flushing	Skin	Flushing	Skin	Flushing
Remarks:					Liver	Hepatotoxicity	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Liver	Hepatotoxicity
2- Ethoxyethanol	10	(40)	10	(40)	0.8	(3)	0.5	(2)	0.07	(0.3)	Not Set	(Not Set)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Blood	Hematotoxicit ..	Blood	Hematotoxicity	Blood	Hematotoxicity	Blood	Hematotoxicity	Blood	Hematotoxicity		
NRC Vol. #: 2 CAS #: 110-80-5	Mucosa	Irritation	Mucosa	Irritation								
Year SMAC was Set/ Reviewed: 1992												
Remarks:												
Ethylbenzene	180	(800)	60	(250)	30	(130)	30	(130)	12	(50)	Not Set	(Not Set)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Testes	Necrosis		
NRC Vol. #: 3 CAS #: 100-41-4	CNS	Depression	CNS	Depression	Testes	Necrosis	Testes	Necrosis				
Year SMAC was Set/ Reviewed: 1993												
Remarks:												

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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SMACs (Spacecraft Maximum Allowable Concentrations)

Potential Exposure Duration

Chemical	1 hr		24 hr		7 d		30 d		180 d		1000 d	
	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)
Ethylene glycol	25	(60)	25	(60)	5	(13)	5	(13)	5	(13)	Not Set	(Not Set)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation		
NRC Vol. #: 3 CAS #: 107-21-1			CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression		
Year SMAC was Set/ Reviewed: 1993					Kidney	Nephrotoxicity	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity		
Remarks:												
Formaldehyde	0.8	(1.0)	0.5	(0.6)	0.1	(0.12)	0.1	(0.12)	0.1	(0.12)	0.1	(0.12)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation
NRC Vol. #: 5 CAS #: 50-00-0											Nose	Cancer
Year SMAC was Set/ Reviewed: 2005												
Remarks: Ceiling values, Carcinogen												
Freon 11	140	(790)	140	(790)	140	(790)	140	(790)	140	(790)	Not Set	(Not Set)
Synonyms: Trichlorofluoromethane	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Heart	Arrhythmia	Heart	Arrhythmia	Heart	Arrhythmia	Heart	Arrhythmia	Heart	Arrhythmia		
NRC Vol. #: 4 CAS #: 75-69-6												
Year SMAC was Set/ Reviewed: 1998												
Remarks:												
Freon 113	50	(400)	50	(400)	50	(400)	50	(400)	50	(400)	Not Set	(Not Set)
Synonyms: 1,1,2-trichloro- 1,2,2-trifluoro-ethane	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Heart	Arrhythmia	Heart	Arrhythmia	Heart	Arrhythmia	Heart	Arrhythmia	Heart	Arrhythmia		
NRC Vol. #: 1 CAS #: 76-13-1												
Year SMAC was Set/ Reviewed: 1991												
Remarks:												

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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SMACs (Spacecraft Maximum Allowable Concentrations)

POTENTIAL EXPOSURE DURATION

Chemical	1 hr ppm	1 hr (mg/m^3)	24 hr ppm	24 hr (mg/m^3)	7 d ppm	7 d (mg/m^3)	30 d ppm	30 d (mg/m^3)	180 d ppm	180 d (mg/m^3)	1000 d ppm	1000 d (mg/m^3)
Freon 12	540	(2600)	95	(470)	95	(470)	95	(470)	95	(470)	Not Set	(Not Set)
Synonyms: Dichlorodifluoromethane	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Heart	Tachycardia	Heart	Arrhythmia	Heart	Arrhythmia	Heart	Arrhythmia	Heart	Arrhythmia		
NRC Vol. #: 4 CAS #: 75-71-8												
Year SMAC was Set/ Reviewed: 1998												
Remarks:												
Freon 21	50	(210)	50	(210)	15	(63)	12	(50)	2	(8)	Not Set	(Not Set)
Synonyms: Dichlorofluoromethane	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Heart	Tachycardia	Heart	Tachycardia	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Liver	Hepatotoxicity		
NRC Vol. #: 4 CAS #: 75-43-4												
Year SMAC was Set/ Reviewed: 1998												
Remarks:												
Freon 22	1000	(3500)	1000	(3500)	1000	(3500)	1000	(3500)	1000	(3500)	Not Set	(Not Set)
Synonyms: Chlorodifluoromethane	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression		
NRC Vol. #: 4 CAS #: 75-45-6	Heart	Arrhythmia	Heart	Arrhythmia	Heart	Arrhythmia	Heart	Arrhythmia	Heart	Arrhythmia		
Year SMAC was Set/ Reviewed: 1998												
Remarks:												
Furan	4	(11)	0.36	(1)	0.025	(0.07)	0.025	(0.07)	0.025	(0.07)	Not Set	(Not Set)
Synonyms: 1,4-Epoxy-1,3-butadiene	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Liver	Cancer	Liver	Cancer	Liver	Cancer		
NRC Vol. #: 4 CAS #: 110-00-9												
Year SMAC was Set/ Reviewed: 1998												
Remarks:												

Abbreviations:
CNS: Central Nervous System
CV: Cardiovascular
DCD: Decreased Color Discrimination
RespSys: Respiratory System
GI: Gastrointestinal tract
U.Blad: Urinary bladder
NRC: National Research Council
PNS: Peripheral Nervous System

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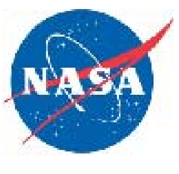
SMACs (Spacecraft Maximum Allowable Concentrations)

POTENTIAL EXPOSURE DURATION

Chemical	1 hr		24 hr		7 d		30 d		180 d		1000 d	
	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)
Glutaraldehyde	0.12	(0.50)	0.04	(0.08)	0.006	(0.025)	0.003	(0.012)	0.0006	(0.002)	Not Set	(Not Set)
Synonyms: 1,5-Pentanedial	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
NRC Vol. #: 3 CAS #: 111-308	Mucosa	Irritation	Mucosa	Irritation	RspSys	Lesions	RspSys	Lesions	RspSys	Lesions		
Year SMAC was Set/ Reviewed: 1993	CNS	Headache	CNS	Headache								
Remarks:												
Hexamethylcyclotrisiloxane	Not Set		Not Set		10	(90)	5	(45)	1	(9)	Not Set	(Not Set)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
NRC Vol. #: 4 CAS #: 541-05-9					RspSys	Injury	RspSys	Injury	RspSys	Injury		
Year SMAC was Set/ Reviewed: 1998					CNS	Depression	CNS	Depression				
Remarks: Documented as a polydimethylcyclosiloxane												
Hydrazine	4	(5)	0.3	(0.4)	0.04	(0.05)	0.02	(0.03)	0.004	(0.005)	Not Set	(Not Set)
Synonyms: Diamine	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
NRC Vol. #: 2 CAS #: 302-01-2		Death	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Liver	Hepatotoxicity		
Year SMAC was Set/ Reviewed: 1993							Liver	Hyperplasia	Nose	Cancer		
Remarks: Carcinogen.							Nose	Cancer				
Hydrogen	4100	(340)	4100	(340)	4100	(340)	4100	(340)	4100	(340)	Not Set	(Not Set)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
NRC Vol. #: 1 CAS #: 1333-74-0		Explosion		Explosion		Explosion		Explosion		Explosion		
Year SMAC was Set/ Reviewed: 1990												
Remarks: Ceiling values are 10% of the Lower Explosive Limit												

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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SMACs (Spacecraft Maximum Allowable Concentrations)

Chemical	1 hr ppm	1 hr (mg/m³)	24 hr ppm	24 hr (mg/m³)	7 d ppm	7 d (mg/m³)	30 d ppm	30 d (mg/m³)	180 d ppm	180 d (mg/m³)	1000 d ppm	1000 d (mg/m³)
Hydrogen chloride Synonyms: HCl NRC Vol. #: 4 CAS #: 7647-01-1 Year SMAC was Set/ Reviewed: 1998 *Remarks:*	5	(8)	2	(3)	1	(1.5)	1	(1.5)	1	(1.5)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Eye	Irritation	Eye	Irritation	Eye	Irritation	Eye	Irritation	Eye	Irritation		
	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation		
Hydrogen cyanide Synonyms: HCN NRC Vol. #: 4 CAS #: 74-90-8 Year SMAC was Set/ Reviewed: 1998 *Remarks:*	8	(9)	4	(4.5)	1	(1.1)	1	(1.1)	1	(1.1)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression		
	CNS	Headache	CNS	Headache	CNS	Headache	CNS	Headache	CNS	Headache		
	CNS	Nausea	CNS	Nausea	CNS	Nausea	CNS	Nausea	CNS	Nausea		
Indole Synonyms: NRC Vol. #: 2 CAS #: 120-72-9 Year SMAC was Set/ Reviewed: 1992 *Remarks:* Normal turnover of indole was used to establish a lower bound of 0.05 ppm.	1.0	(5)	0.3	(1.5)	0.05	(0.25)	0.05	(0.25)	0.05	(0.25)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	CNS	Nausea	CNS	Nausea	CNS	Nausea	CNS	Nausea	CNS	Nausea		
			Blood	Hematotoxicity	Blood	Hematotoxicity	Blood	Hematotoxicity	Blood	Hematotoxicity		
Isoprene Synonyms: 2-Methyl-1,3-butadiene NRC Vol. #: 4 CAS #: 78-79-5 Year SMAC was Set/ Reviewed: 1998 *Remarks:*	50	(140)	25	(70)	2	(6)	2	(6)	1	(3)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Lung	Injury		
					Blood	Anemia	Blood	Anemia	Blood	Anemia		
									CNS	Neurotoxicity		

Potential Exposure Duration

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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SMACs (Spacecraft Maximum Allowable Concentrations)

POTENTIAL EXPOSURE DURATION

Chemical	1 hr		24 hr		7 d		30 d		180 d		1000 d	
	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)	ppm	(mg/m³)
Limonene Synonyms: NRC Vol. #: 5 CAS #: 2008 Year SMAC was Set/ Reviewed: *Remarks:*	80	(450)	80	(450)	20	(115)	20	(115)	20	(115)	20	(115)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Eye	Irritation	Eye	Irritation	Eye	Irritation	Eye	Irritation	Eye	Irritation	Eye	Irritation
	Lung	Irritation	Lung	Irritation	Lung	Irritation	Lung	Irritation	Lung	Irritation	Lung	Irritation
Mercury Synonyms: Quicksilver NRC Vol. #: 2 CAS #: 7439-97-6 Year SMAC was Set/ Reviewed: 1992 *Remarks:*	0.01	(0.1)	0.002	(0.02)	0.001	(0.01)	0.001	(0.01)	0.001	(0.01)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Lung	Irritation	Lung	Irritation	CNS	Neurotoxicity	CNS	Neurotoxicity	CNS	Neurotoxicity		
					Kidney	Nephrotoxicity	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity		
Methane Synonyms: Natural gas NRC Vol. #: 1 CAS #: 74-82-8 Year SMAC was Set/ Reviewed: 1990 *Remarks:* Ceiling values are 10% of the Lower Explosive Limit. Methane is a non-toxic simple asphyxiant.	5300	(3500)	5300	(3500)	5300	(3500)	5300	(3500)	5300	(3500)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
		Explosion		Explosion		Explosion		Explosion		Explosion		
Methanol Synonyms: Wood alcohol NRC Vol. #: 5 CAS #: 67-56-1 Year SMAC was Set/ Reviewed: 2008 *Remarks:*	200	(260)	70	(90)	70	(90)	70	(90)	70	(90)	23	(30)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Eye	Visual disturbance	Eye	Visual disturbance	Eye	Visual disturbance	Eye	Visual disturbance	Eye	Visual disturbance	Eye	Visual disturbance

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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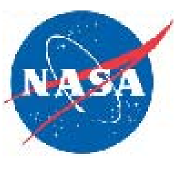
SMACs (Spacecraft Maximum Allowable Concentrations)

POTENTIAL EXPOSURE DURATION

Chemical	1 hr ppm	1 hr (mg/m³)	24 hr ppm	24 hr (mg/m³)	7 d ppm	7 d (mg/m³)	30 d ppm	30 d (mg/m³)	180 d ppm	180 d (mg/m³)	1000 d ppm	1000 d (mg/m³)
Methyl Ethyl Ketone Synonyms: 2-Butanone NRC Vol. #: 2 CAS #: 78-93-3 Year SMAC was Set/ Reviewed: 1992 *Remarks:* Ceiling values	50	(150)	50	(150)	10	(30)	10	(30)	10	(30)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation		
Methyl hydrazine Synonyms: Monomethylhydrazine NRC Vol. #: 4 CAS #: 60-34-4 Year SMAC was Set/ Reviewed: 1991 *Remarks:* Carcinogen	0.002	(0.004)	0.002	(0.004)	0.002	(0.004)	0.002	(0.004)	0.002	(0.004)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Nose	Lesions	Nose	Lesions	Nose	Lesions	Nose	Lesions	Nose	Lesions		
4- Methyl-2-pentanone Synonyms: Methyl isobutyketone, MIBK NRC Vol. #: 4 CAS #: 108-10-1 Year SMAC was Set/ Reviewed: 1994 *Remarks:*	35	(140)	35	(140)	35	(140)	35	(140)	35	(140)	Not Set	(Not Set)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression		
	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation		
Methylene chloride Synonyms: Dichloromethane NRC Vol. #: 5 CAS #: 75-09-2 Year SMAC was Set/ Reviewed: 2007 *Remarks:* CO formation, Carcinogen	100	(350)	35	(120)	14	(49)	7	(24)	3	(10)	1	(3.5)
	Organ	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	CNS	Depression	CNS	Depression	CNS	Depression	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Kidney	Nephrotoxicity

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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SMACs (Spacecraft Maximum Allowable Concentrations)

Potential Exposure Duration

Chemical	1 hr ppm	1 hr (mg/m^3)	24 hr ppm	24 hr (mg/m^3)	7 d ppm	7 d (mg/m^3)	30 d ppm	30 d (mg/m^3)	180 d ppm	180 d (mg/m^3)	1000 d ppm	1000 d (mg/m^3)
Nitromethane	25	(65)	15	(40)	7	(18)	7	(18)	5	(13)	Not Set	(Not Set)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Blood	Anemia	Blood	Anemia	Blood	Anemia	Blood	Anemia	Blood	Anemia		
NRC Vol. #: 2 CAS #: 75-52-5												
Year SMAC was Set/ Reviewed: 1992												
Remarks:												
Octamethylcyclotetrasiloxane	Not Set		Not Set		23	(280)	5	(60)	1	(12)	Not Set	(Not Set)
Synonyms:	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
					RspSys	Injury	RspSys	Injury	Gonad	Toxicity		
NRC Vol. #: 4 CAS #: 556-67-2					CNS	Depression	Gonad	Toxicity	RspSys	Injury		
Year SMAC was Set/ Reviewed: 1998					Gonad	Toxicity						
Remarks: Documented as a polydimethylcyclosiloxane												
Octamethyltrisiloxane	400	(4000)	200	(2000)	100	(1000)	20	(200)	4	(40)	Not Set	(Not Set)
Synonyms: MDM	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
		Death	.	Death	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Liver	Hepatotoxicity		
NRC Vol. #: 1 CAS #: 107-51-7			Liver	Hepatotoxicity	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity	Kidney	Nephrotoxicity		
Year SMAC was Set/ Reviewed: 1992			Kidney	Nephrotoxicity								
Remarks: Based on structure activity relationships												

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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SMACs (Spacecraft Maximum Allowable Concentrations)

Potential Exposure Duration

Chemical	1 hr ppm	1 hr (mg/m³)	24 hr ppm	24 hr (mg/m³)	7 d ppm	7 d (mg/m³)	30 d ppm	30 d (mg/m³)	180 d ppm	180 d (mg/m³)	1000 d ppm	1000 d (mg/m³)
Perfluoropropane (Aliphatic Perfluoroalkanes)	11,000	(85,000)	11,000	(85,000)	11,000	(85,000)	11,000	(85,000)	11,000	(85,000)	Not Set	(Not Set)
Synonyms: Octafluoropropane	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
NRC Vol. #: 4 CAS #: 76-19-7	CNS	Symptoms	CNS	Symptoms	CNS	Symptoms	CNS	Symptoms	CNS	Symptoms		
Year SMAC was Set/ Reviewed: 1998												
Remarks: This group SMAC is not applicable to perfluorocycloalkanes. SMACs in mg/m3 apply only to perfluorpropane.												
2- Propanol	400	(1000)	100	(240)	60	(150)	60	(150)	60	(150)	Not Set	(Not Set)
Synonyms: Isopropanol	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression	CNS	Depression		
NRC Vol. #: 2 CAS #: 67-63-0	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation	Mucosa	Irritation		
Year SMAC was Set/ Reviewed: 1992			Liver	Hepatotoxicity	Liver	Hepatotoxicity	PNS	Decr. cond'n. velocity				
Remarks:												
Propylene glycol	32	(102)	17	(54)	9	(29)	3	(9.6)	1.5	(4.8)	1.5	(4.8)
Synonyms: 1,2-Propanediol; Methyl glycol	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Eye	Irritation	Eye	Irritation	Eye	Discharge	Eye	Discharge	Nose	Epithelium thickening	Nose	Epithelium thickening
	Throat	Irritation	Throat	Irritation	Nose	Hemorrhage	Nose	Hemorrhage				
NRC Vol. #: 5 CAS #: 57-55-6	Lung	Irritation	Lung	Irritation								
Year SMAC was Set/ Reviewed: 2008												
Remarks:												

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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SMACs (Spacecraft Maximum Allowable Concentrations)

POTENTIAL EXPOSURE DURATION

Chemical	1 hr ppm (mg/m³)	24 hr ppm (mg/m³)	7 d ppm (mg/m³)	30 d ppm (mg/m³)	180 d ppm (mg/m³)	1000 d ppm (mg/m³)
Toluene Synonyms: Methyl benzene NRC Vol. #: 5 CAS #: 108-88-3 Year SMAC was Set/ Reviewed: 2008 *Remarks:*	16 (60) *Organ* / *Effect* CNS / Depression	16 (60) *Organ* / *Effect* CNS / Dizziness	4 (15) *Organ* / *Effect* Ear / Ototoxicity Eye / DCD	4 (15) *Organ* / *Effect* Ear / Ototoxicity Eye / DCD	4 (15) *Organ* / *Effect* Ear / Ototoxicity Eye / DCD Gonads / Hormone	4 (15) *Organ* / *Effect* Ear / Ototoxicity Eye / DCD Gonads / Hormone
Trichloroethylene Synonyms: NRC Vol. #: 3 CAS #: 79-01-6 Year SMAC was Set/ Reviewed: 1992 *Remarks:* See dichloroacetylene if alkali scrubber is present. Possible carcinogen.	50 (270) *Organ* / *Effect* CNS / Depression Heart / Arrhythmia	11 (60) *Organ* / *Effect* CNS / Depression	9 (50) *Organ* / *Effect* Kidney / Nephrotoxicity Liver / Hepatotoxicity	4 (20) *Organ* / *Effect* Kidney / Nephrotoxicity Liver / Hepatotoxicity	2 (10) *Organ* / *Effect* Multi. / Cancer Kidney / Nephrotoxicity Liver / Hepatotoxicity	Not Set (Not Set) *Organ* / *Effect*
Trimethylsilanol Synonyms: Trimethylhydroxysilane NRC Vol. #: 5 CAS #: 1066-40-6 Year SMAC was Set/ Reviewed: 2008 *Remarks:*	15 (55) *Organ* / *Effect* CNS / Depression	2 (7) *Organ* / *Effect* CNS / Depression	1 (4) *Organ* / *Effect* CNS / Depression	1 (4) *Organ* / *Effect* CNS / Depression	1 (4) *Organ* / *Effect* CNS / Depression	1 (4) *Organ* / *Effect* CNS / Depression
Unsymmetrical Dimethylhydrazine Synonyms: 1,1-Dimethylhydrazine, UDMH NRC Vol. #: 5 CAS #: 57-14-7 Year SMAC was Set/ Reviewed: 2008 *Remarks:*	3 (7.5) *Organ* / *Effect* CNS	0.12 (0.3) *Organ* / *Effect* CNS	0.03 (0.075) *Organ* / *Effect* Blood / Anemia	0.017 (0.0425) *Organ* / *Effect* Blood / Anemia	0.003 (0.0075) *Organ* / *Effect* Liver / Hepatotoxicity	Not Set (Not Set) *Organ* / *Effect*

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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SMACs (Spacecraft Maximum Allowable Concentrations)

POTENTIAL EXPOSURE DURATION

Chemical	1 hr ppm	1 hr (mg/m³)	24 hr ppm	24 hr (mg/m³)	7 d ppm	7 d (mg/m³)	30 d ppm	30 d (mg/m³)	180 d ppm	180 d (mg/m³)	1000 d ppm	1000 d (mg/m³)
Vinyl chloride	130	(330)	30	(77)	1	(2.6)	1	(2.6)	1	(2.6)	Not Set	(Not Set)
Synonyms: Chloroethene; chloroethylene	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Testes	Necrosis	Testes	Necrosis	Testes	Necrosis		
NRC Vol. #: 1 CAS #: 75-01-4	CNS	Headache	CNS	Headache	Liver	Hepatotoxicity	Liver	Hepatotoxicity	Liver	Cancer		
Year SMAC was Set/ Reviewed: 1992	CNS	Depression	CNS	Depression								
Remarks: Carcinogen												
Xylene	50	(215)	17	(73)	17	(73)	17	(73)	8.5	(37)	1.5	(6.5)
Synonyms: Dimethylbenzene, xylol	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*	*Organ*	*Effect*
	Mucosa	Irritation	Mucosa	Irritation	CNS	Neurotoxicity	CNS	Neurotoxicity	Ear	Ototoxicity	Ear	Ototoxicity
NRC Vol. #: 5 CAS #: 1330-20-7	CNS	Depression	CNS	Depression								
Year SMAC was Set/ Reviewed: 2008	Eye	Irritation	Eye	Irritation								
Remarks: Applies to each individual xylene isomer and mixtures of xylene isomers.												

Abbreviations: CNS: Central Nervous System; CV: Cardiovascular; DCD: Decreased Color Discrimination; RespSys: Respiratory System; GI: Gastrointestinal tract; U.Blad: Urinary bladder; NRC: National Research Council; PNS: Peripheral Nervous System

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